

Instrumentation 2006

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Improvements in '06

- Major upgrade to the RHIC BPM system was completed.
- A new light monitoring system was installed on the Jet.
- BLIP interlock problems were solved (mostly).
- Many achievements with HF instrumentation.
- Pulsed grids on the RHIC IPM increased channel plate longevity (but may have created other problems).
- Steady elimination of legacy (ie datacon) systems continues (H10 flag is now VME based).
- Resurrection of the AGS jump targets.

Improvements for '07

- Steady improvement of old systems (ie datacon removal)
- BTA foil stripper motion control upgrade
- AGS IPM electronics upgrade
- Jump target system completion
- BBQ system for the AGS?
- Complete installation of the Traveling Wave Cavity DAQ
- Numerous specialty systems (AGS WCM peak detector, BBLR monitor, etc)

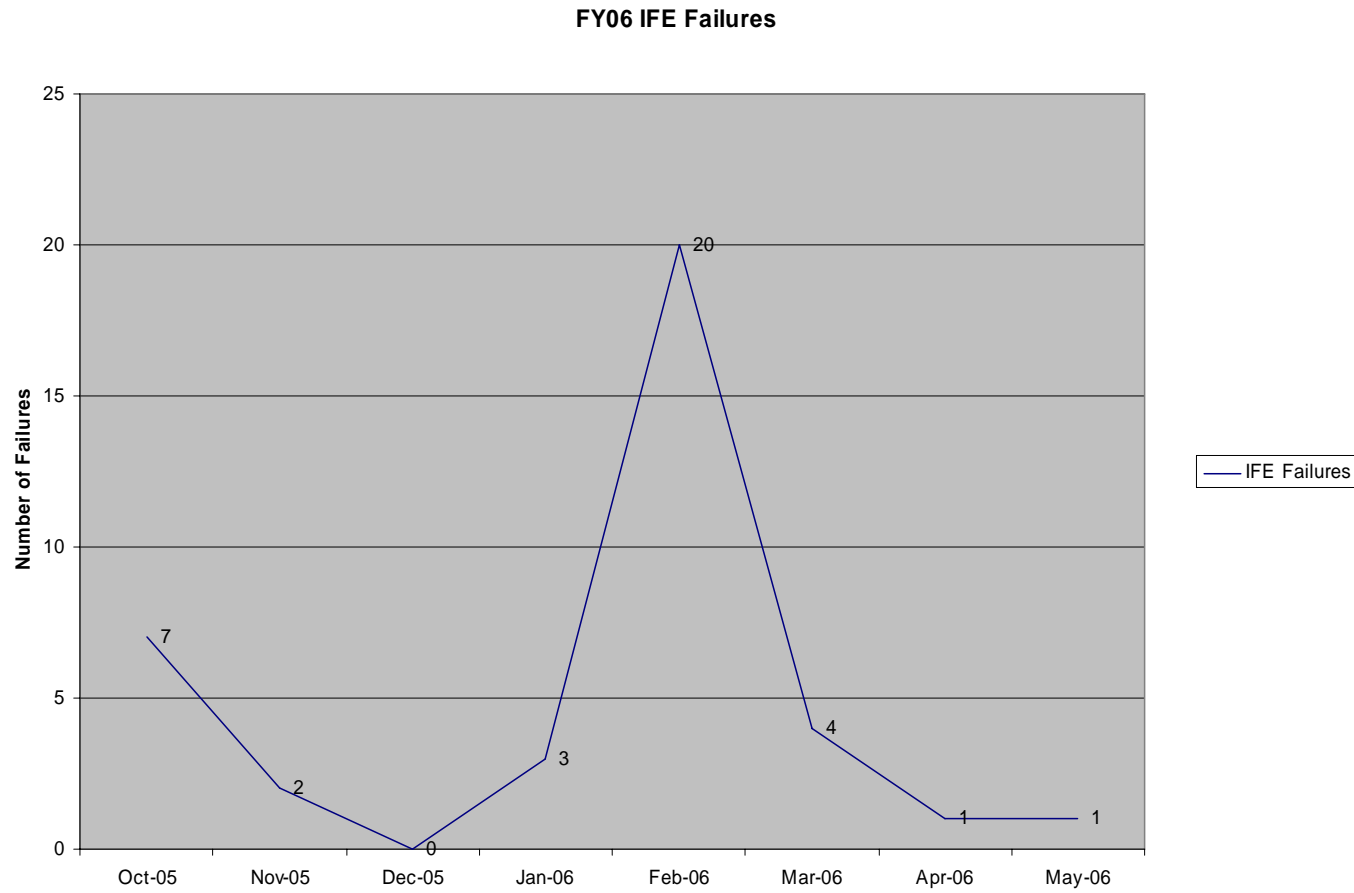
RHIC BPM

- Significant hardware and software modifications last year (including relay removal) lead to an overall increase in performance and reliability.
- Remaining work is primarily DSP code for accurate peak detection and calibration of internal pulser vs external signal.
- We won't be taking them out again this year.

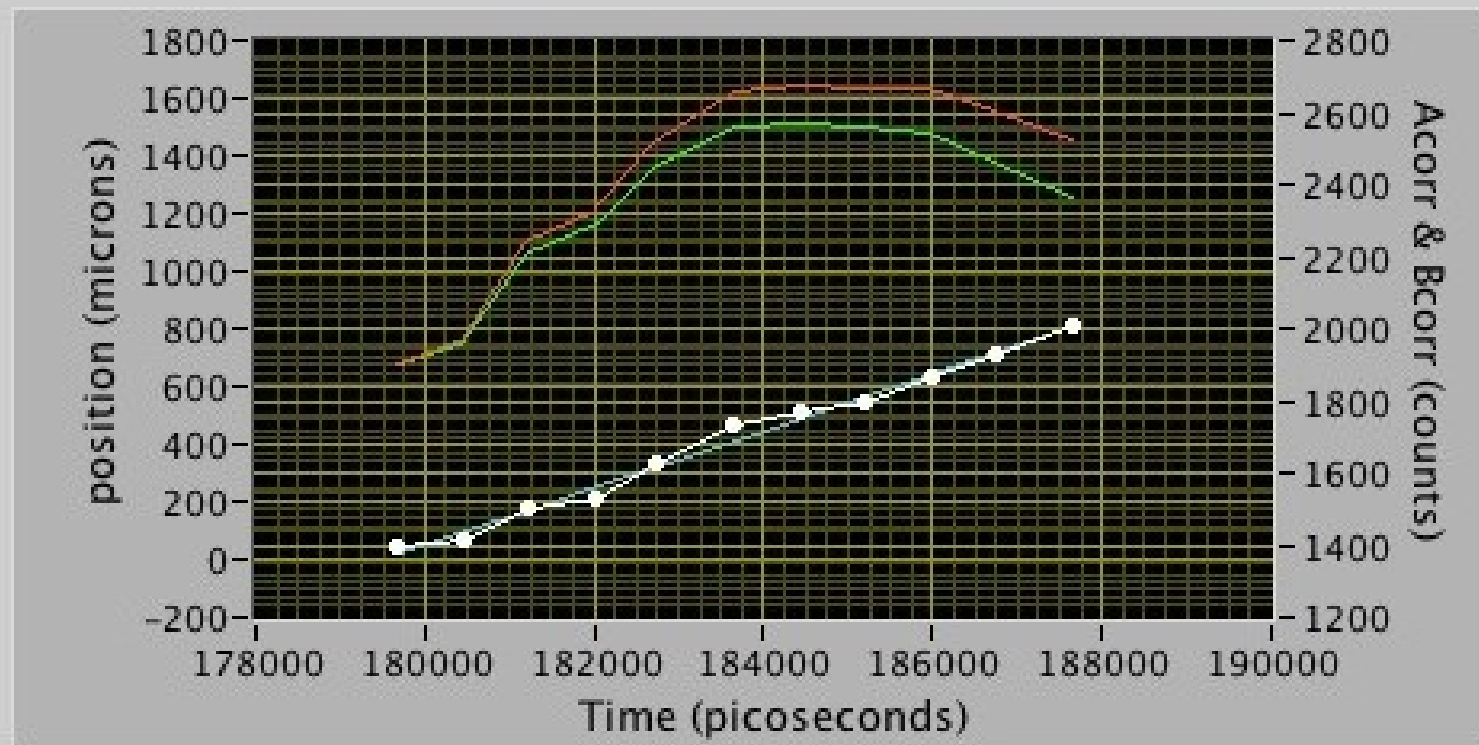
RHIC BPM boards



IFE Failures vs Time 2006



Position drift vs time uncorrected



shift

C10

C11

modify coefficients error

position slope

position delta

scan error

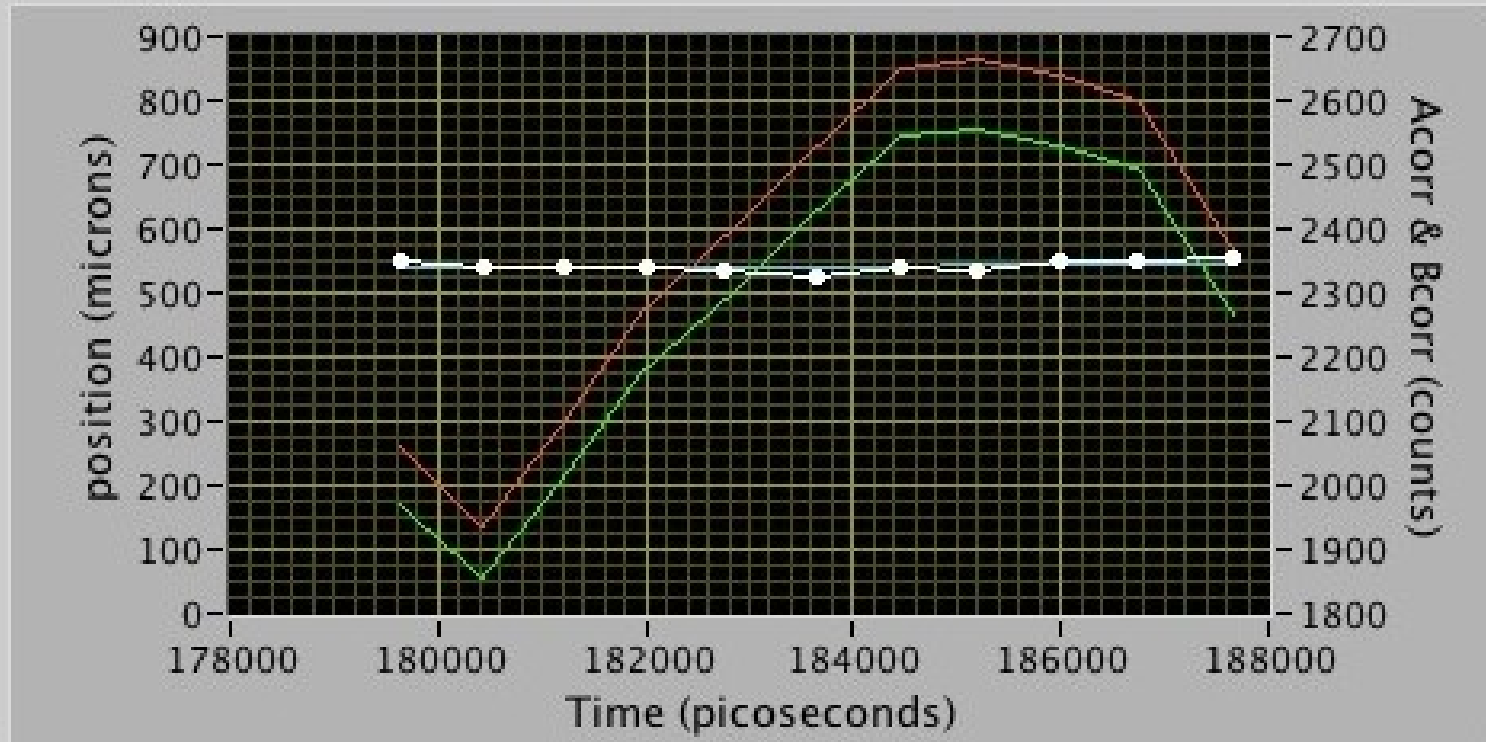
position

Acorr

Bcorr

pos fit

Position drift vs time corrected



shift

C10

C11

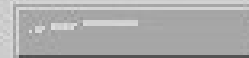
modify coefficients error



position slope

position delta

scan error



position

Accr

Bcorr

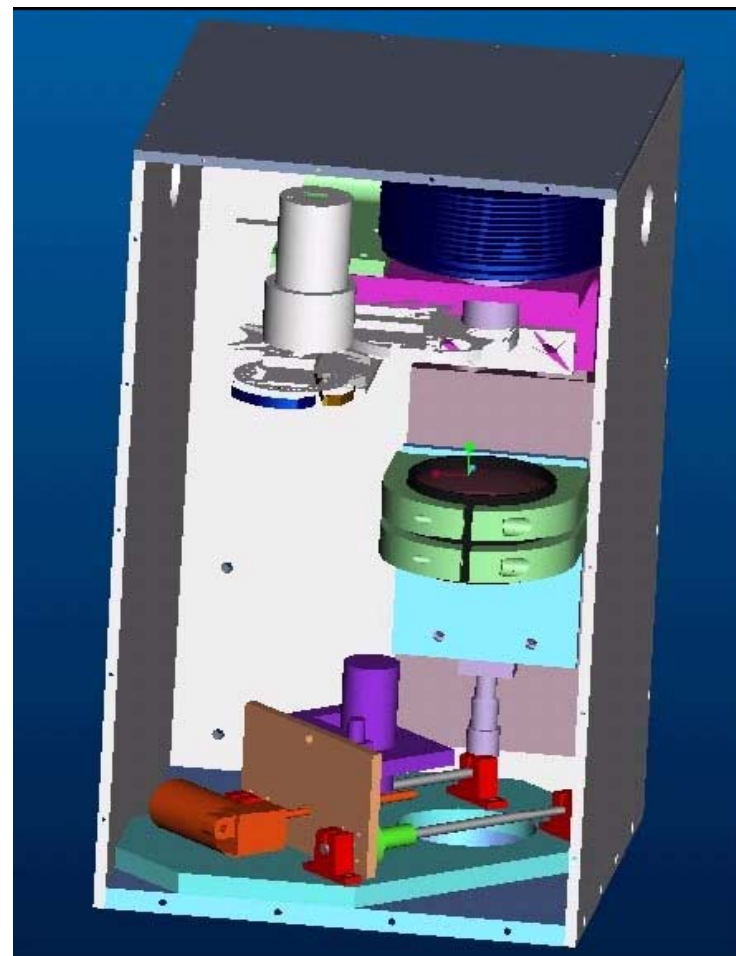
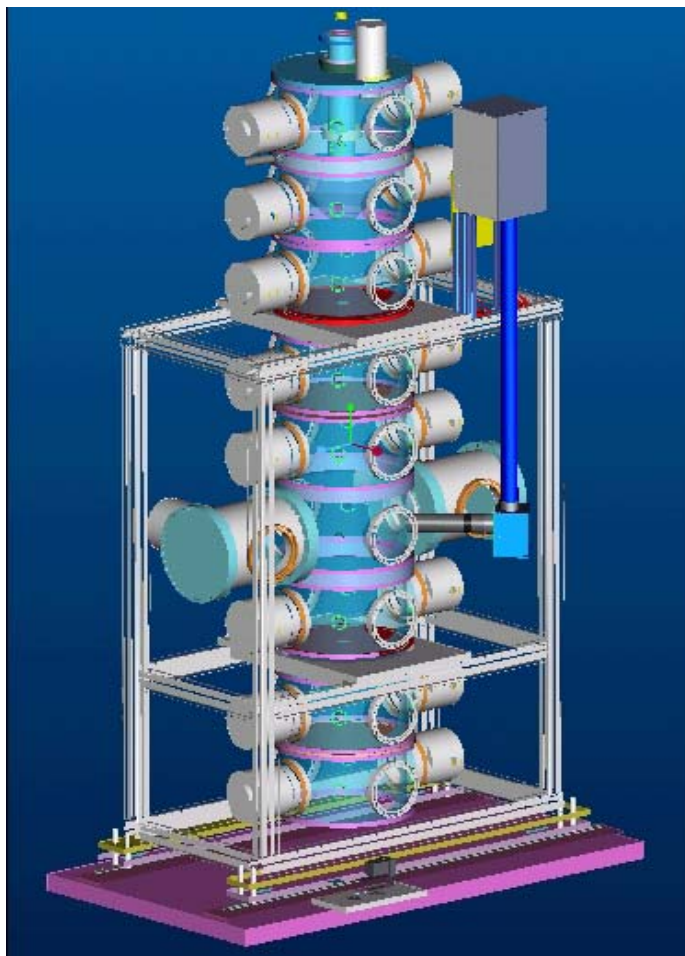
pos fit



Luminescence Monitor

- Uses the hydrogen jet/ beam interaction to make measurements of the beam size.
- See Dave Gassner's web site for more information.

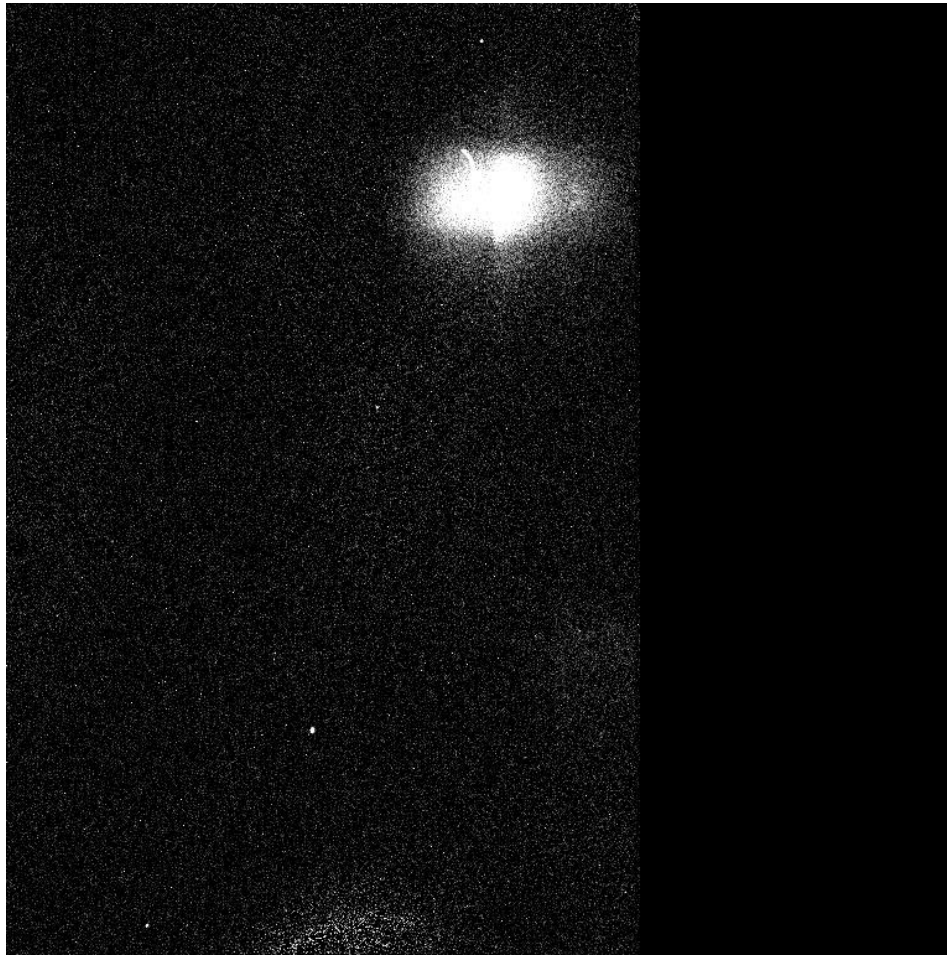
System Block Diagram



Below is a series of images (30 second integration) taken every few minutes during a RHIC fill arranged in a time lapse format over about 20 minutes, courtesy of Thomas Tsang.



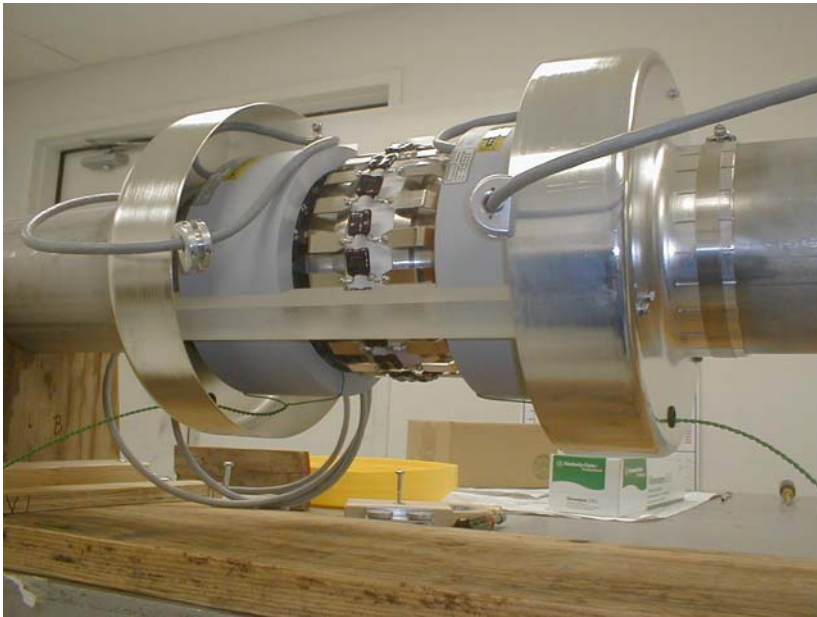
This gif animation is a sequence of 70 images. The luminescence from the Blue beam appears as the upper image and occurs before the Yellow due to the filling order. The “flash” is the insertion of the polarimeter.

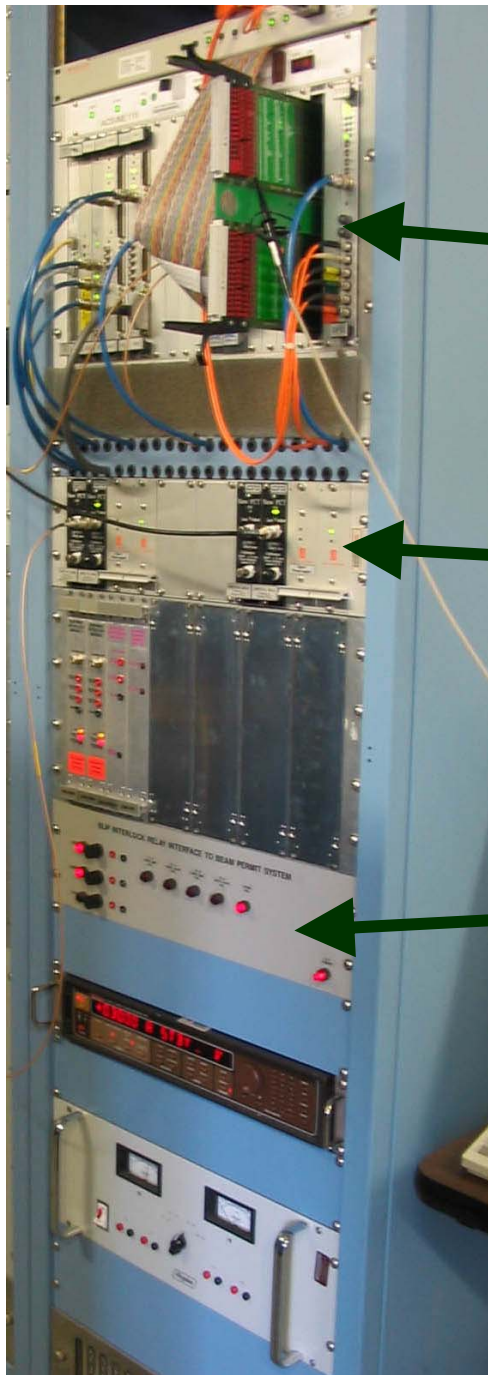


RHIC/BLIP CT SPURIOUS TRIPS

- '04 – System was installed in the AGS ring. First year we had many spurious trips. These interrupt RHIC injection.
- 7/05 – Bergoz electronics upgrade
- 10/05 – Install Relay chassis, drive permits w/ hard +5V, not TTL levels. Additional dielectric breaks were added for the analog channels.
- 2/06 – Remove current limiting resistor in chassis, solves problem until...
- 6/06 – VME self-rebooting mystery → updating software didn't solve, investigating hardware
- Of note – interference seen on signals when power supplies in B18 are pulsing
- Also we analyzed primary power – found nothing. UPS made things worse.

Transformers





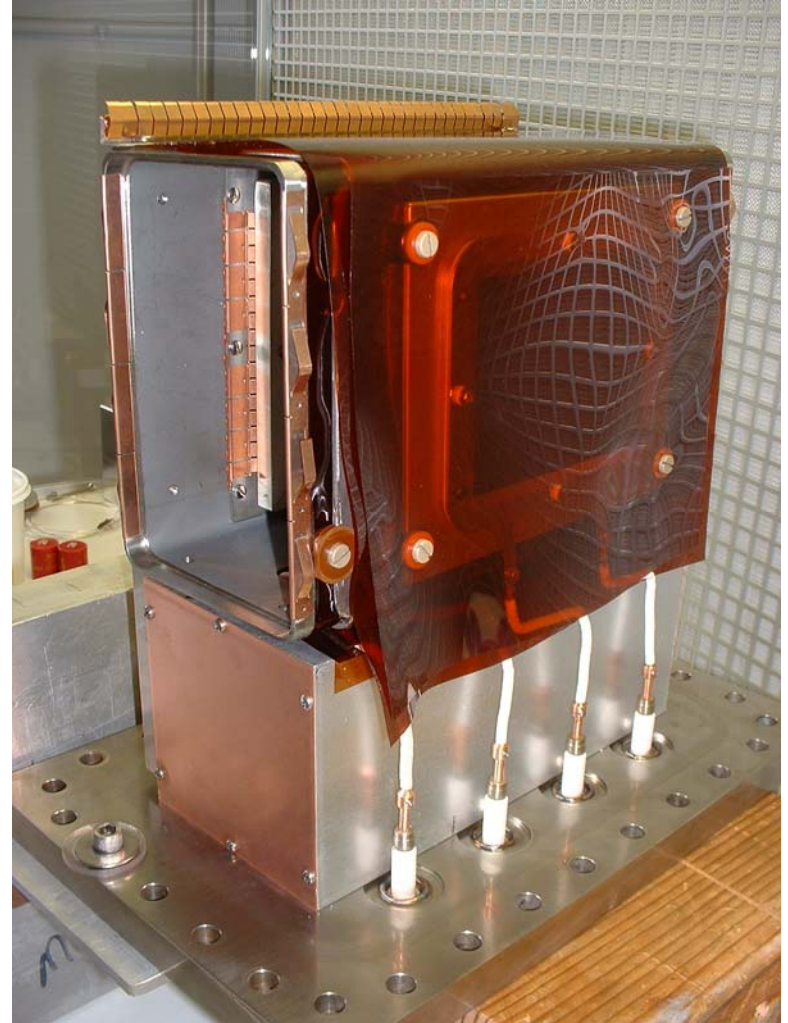
• VME chassis w/
monitoring equipment

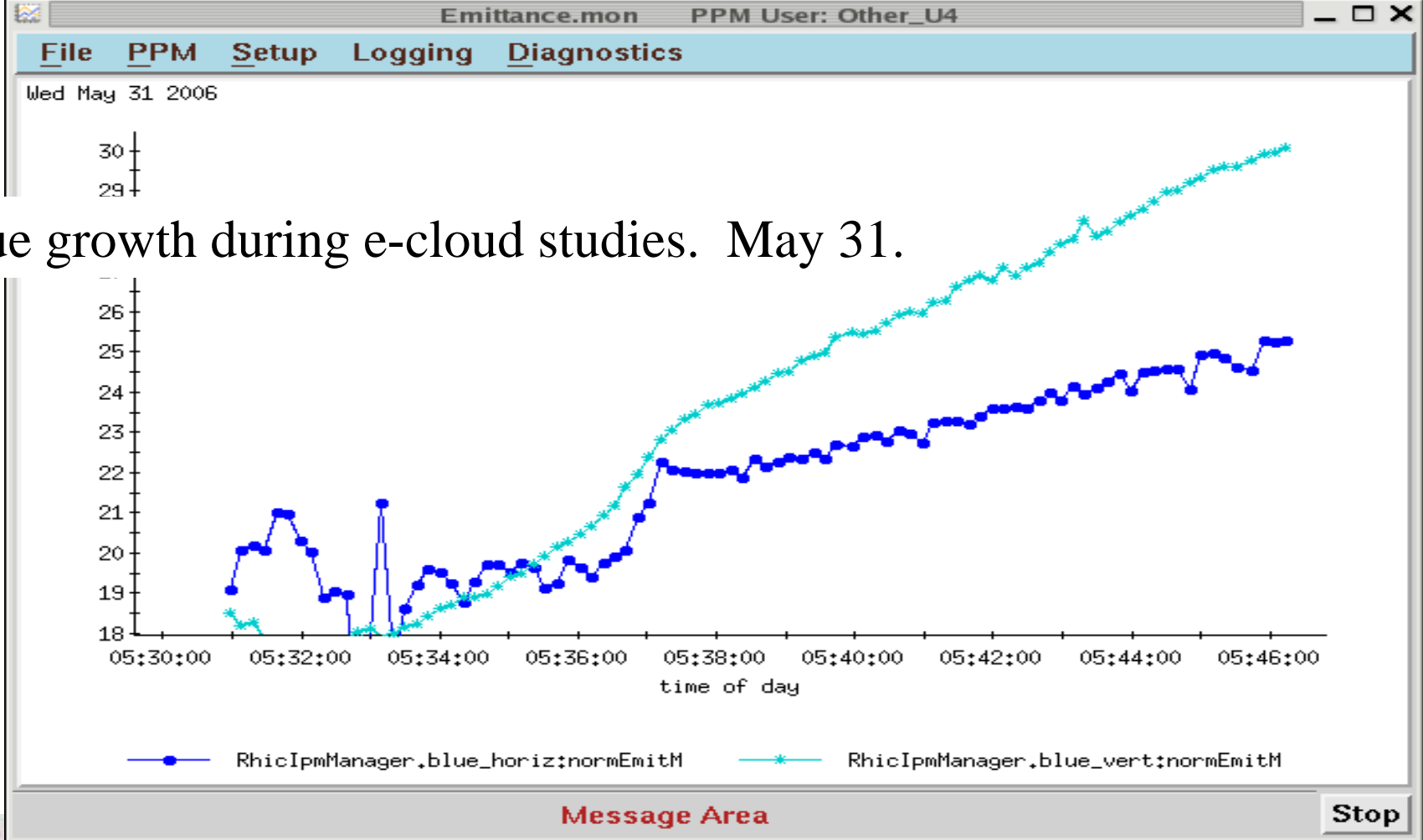
• Bergoz electronics

• Relay chassis

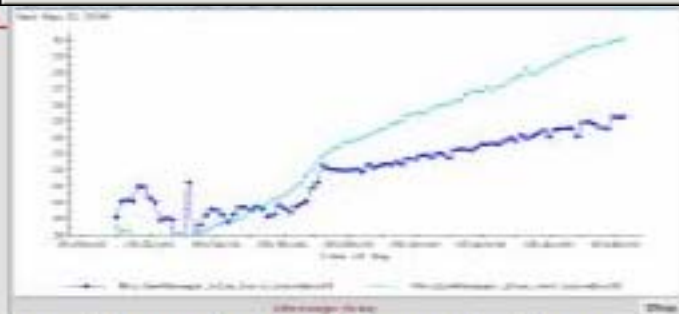
RHIC IPM

- Gated grids were added in '04 to extend MCP lifetime.
- The pulsing grids also perturbed the beam and the electronics.
- The Blue Vertical IPM was modified with improved shielding for both the MCP and beam.
- There is debate as to the efficacy of this shielding.
- We are building a 5th unit as a spare for study outside of the RHIC tunnel.





05:46



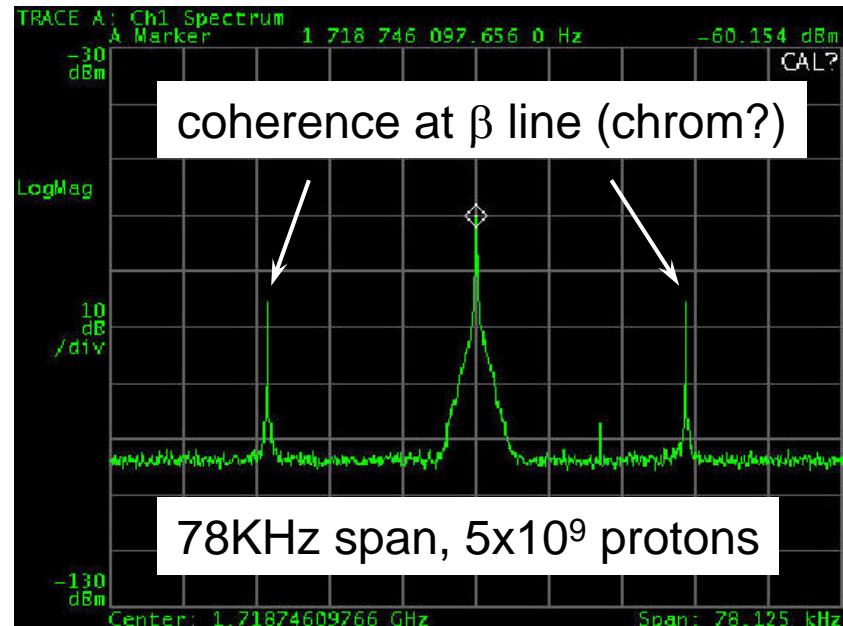
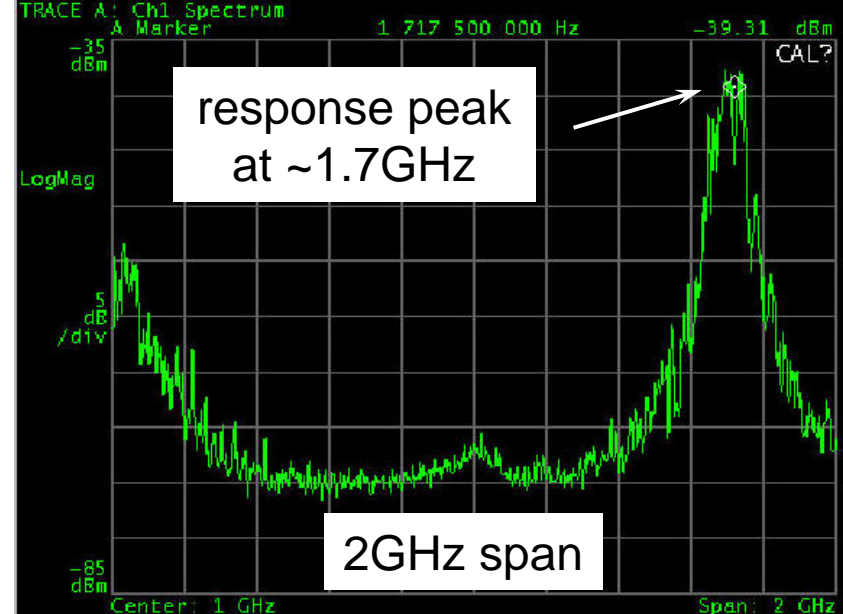
:51 Blue emittance (especially vertical) growing up very quickly after Blue fill. -VP,RC,SY,HH

High Frequency Instrumentation

- Added additional resources to support efforts.
- PLL – problems continue to plague the DAQ. This is now a low priority system – replaced by the BBQ.
- HF Schottky – a working system.
- LF Schottky – a work in progress.
- BBQ – some excellent results with this system.
- Traveling Wave Cavity

TW Schottky Run 6

- Install pickup **done**
- Purchase and install DSA **done**
- Observe raw signals **done**
- Adjust phases and amplitudes to minimize revolution line **done**
- Move preamps to tunnel to maximize signal-to-noise **not done**
- Double down-convert to baseband to improve filtering and dynamic range
- Analysis software **not done**
- Gated bunch-by-bunch measurements **not done**



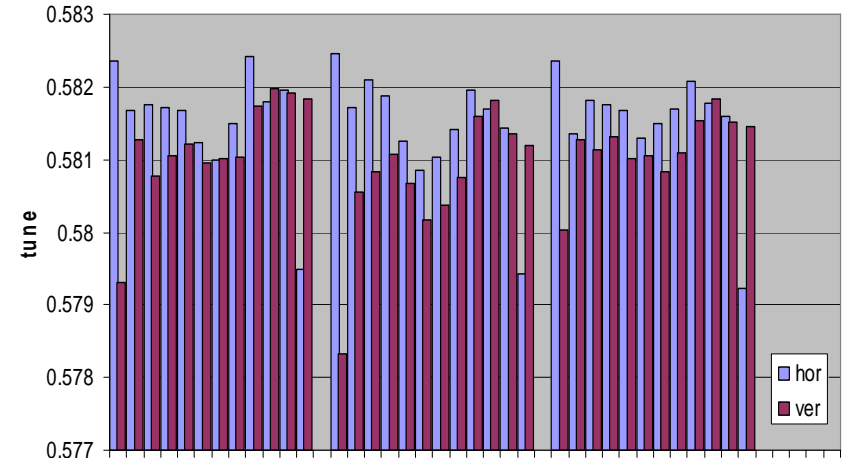
TW Schottky to-do for Run 7

- Goal – bunch-by-bunch measurement of tune, chrom, and emittance
 - absolute calibration of Schottky always somewhat questionable
 - relative bunch-by-bunch calibration will be excellent and valuable
- From Run 6
 - Move preamps to tunnel to maximize S/N
 - Double down-convert to baseband to improve filtering and dynamic range
 - Analysis software
 - Gated bunch-by-bunch measurements
- Additional possibilities
 - Second pickup (now vertical only both rings)
 - Third and fourth pickup (present pickup at IP10, directional coupler isolation is 10-15dB between blue and yellow)
 - Improved control, analysis, and display software

FNAL pbars

$\sim 2 \times 10^{10}$ / bunch

bunch-by-bunch pbar tunes



bunch-by-bunch emittance

